

Appl. No. 10/603,361
Paper filed 02/28/2008
Suppl. Resp. to Office action of 10/30/2007

Attorney Docket No.: N1085-00089
TSMC 2002-0917

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Listing of Claims:

The listing of pending claims is as follows:

- 1 1. (Previously Presented) A method of making a multiple gate electrode on a
2 semiconductor device, comprising the steps of:
3 coating a layer of gate electrode material over top and past the opposed sides of
4 a semiconductor device that has been previously coated with a thin film of gate
5 dielectric on the top and the opposed sides of the semiconductor device; and
6 planarizing the layer of gate electrode material to produce a substantially planar
7 surface formed only of the gate electrode material disposed atop the semiconductor
8 device and extending distally past each of the opposed sides, prior to patterning the
9 gate electrode material to form a discrete multiple gate electrode on the semiconductor
10 device, the substantially planar surface having the same height at locations superjacent
11 the semiconductor device and at locations distal the semiconductor device,
12 wherein the semiconductor device comprises a semiconductor fin with a planar
13 top surface and the top and the opposed sides of the semiconductor device each form a
14 channel portion of a single associated transistor.
- 1 2. (Previously Presented) The method of claim 1, further comprising the steps of:
2 applying a photoresist mask of substantially uniform thickness and a planar top
3 surface on the planar top surface of the planarized gate electrode material including
4 directly over the semiconductor device;
5 patterning the photoresist mask to cover a corresponding pattern of the discrete
6 multiple gate electrode; and
7 etching the gate electrode material that is uncovered by the photoresist mask to
8 form the discrete multiple gate electrode.
- 1 3. (Previously Presented) The method of Claim 1, wherein the step of coating
2 includes:

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3 conforming the layer of gate electrode material with a step height increase
4 corresponding to an increased step height of the semiconductor device.

1 4. (Previously Presented) The method of claim 1, wherein the semiconductor fin
2 comprises a silicon fin.

1 5. (Previously Presented) The method of claim 1 wherein, the semiconductor fin
2 comprises a fin of silicon and germanium.

1 6. (Previously Presented) The method of claim 1, further comprising the steps of:
2 applying a photoresist mask of substantially uniform thickness and a planar top
3 surface on the planar top surface of the planarized gate electrode material including
4 directly over the semiconductor device, the mask comprising photoresist and a mask
5 material selected from the group comprising, silicon nitride, silicon oxynitride, silicon
6 oxide and photo resist, or combinations thereof;
7 patterning the photoresist mask to cover a corresponding pattern of the multiple
8 gate electrode; and
9 etching the gate electrode material that is uncovered by the photoresist mask to
10 form the discrete multiple gate electrode.

1 7. (Previously Presented) The method of claim 1, further comprising the steps of:
2 applying a photoresist mask of substantially uniform thickness and a planar top
3 surface on the planar top surface of the planarized gate electrode material including
4 directly over the semiconductor device;
5 patterning the photoresist mask to cover a corresponding pattern of the multiple
6 gate electrode; and
7 plasma etching the gate electrode material that is uncovered by the photoresist
8 mask to form the patterned multiple gate electrode.

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- 1 8. (Previously Presented) The method as recited in claim 1, further comprising the
2 step of: applying a mask over the substantially planar surface, wherein the mask is of
3 substantially uniform thickness for accurate patterning thereof.
- 1 9. (Original) The method of claim 1 wherein, the gate dielectric comprises silicon
2 oxide.
- 1 10. (Original) The method of claim 1 wherein, the gate dielectric comprises silicon
2 oxynitride.
- 1 11. (Original) The method of claim 1 wherein, the gate dielectric comprises a high
2 permittivity material.
- 1 12. (Original) The method of claim 1 wherein, the gate dielectric comprises a material
2 having a permittivity greater than 5.
- 1 13. (Original) The method of claim 1 wherein, the gate dielectric comprises a
2 thickness in the range of 3 and 100 Angstroms.
- 1 14. (Previously Presented) The method of claim 1 wherein, the thin film of gate
2 dielectric is disposed directly on the top and directly on the opposed sides of the
3 semiconductor device and the multiple gate electrode comprises polycrystalline silicon
4 and is disposed directly on the thin film of gate dielectric.
- 1 15. (Original) The method of claim 1 wherein, the multiple gate electrode comprises
2 a conductive material.
- 1 16. (Original) The method of claim 1 wherein, the multiple gate electrode comprises
2 a metal material.

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1 17. (Previously Presented) A semiconductor device having a multiple gate electrode,
2 comprising:

3 a projecting fin having a planar top surface and coated with a gate dielectric film
4 over top and opposed sides of the fin;

5 a multiple gate electrode on each of the opposed sides of the fin, the multiple
6 gate electrode formed of a layer of gate electrode material and having a substantially
7 planar surface disposed atop the gate dielectric film formed over the top of the fin and
8 extending distally past each of the opposed sides of the fin the top and the opposed
9 sides of the fin each forming a channel portion of a single associated transistor; and

10 a patterned mask on the planar surface of the multiple gate electrode, the
11 patterned mask having a substantially uniform thickness and a substantially planar
12 surface including over the fin.

1 18. (Previously Presented) The semiconductor device of claim 17 wherein, the
2 multiple gate electrode is a portion of the layer of gate electrode material which has a
3 planarized surface that includes the planar surface of the multiple gate electrode.

1 19. (Cancelled)